ASJ: *International Journal of Agricultural Research, Sustainability, and Food Sufficiency (IJARSFS)*
Vol. 4(2) 04 August, 2017, Pp. 151-I59
www.academiascholarlyjournal.org/ijarsfs/index_ijarsfs.htm
ISSN: 2360-932X©Academia Scholarly Journals
Indexed In: Directory of Research Journals Indexing - http://www.drji.org
Also Available@; https://archive.org/details/ Ezebuiro_et_al.
Open access

Full Length Research

CASSAVA GENETIC DIVERSITY AND CONSERVATION IN SOUTH-EAST NIGERIA

Ezebuiro N.C.[1*], Ekumankama O.O.[2], Ugboaja C.I. [2], and Ironkwe A.G.[1]

[1]National Root Crops Research Institute, Umudike, Abia State, Nigeria.

[2]Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

Accepted July 30, 2017

Investigation into farmers' approaches to cassava genetic resources and conservation was carried out in three states of South-East Agro-Ecological Zone of Nigeria purposely selected. The genetic resources of cassava consist of local, introduced landraces, improved cultivars and related wild species. Genetic resources of *Manihot* genus is eroding in the face of expansion agriculture with hundreds of varieties being abandoned or lost over the years. Data were collected from the 480 respondents by the use of structured interview schedule. Results obtained were analyzed using descriptive and inferential statistics. There were more male respondents (61.5%) than females, with mean age of 26.0 years. Majority of the respondents were literate. About 76.0% planted improved cassava varieties, while 56.2% maintained favoured varieties. Other major indigenous practices for cassava conservation by the respondents were by storage of stakes under shade, which accounted for 44.8%. The Tobit Regression Estimate of the determinants of level of use of conservation practices showed that the Coefficient of education was positively correlated and significant at 5% level of probability. The coefficient of farm size was negatively correlated and highly significant at 1% level of probability. There is need for research and policy makers to lay more emphasis on conservation of cassava genetic resources to reduce genetic erosion that is taking great toll on the available resources; ensuring food security and availability of genetic resources.

Keywords: Genetic Diversity, Conservation, Cassava, genetic resources, agro-ecological zone.

INTRODUCTION

The best known member of the genus *Manihot*, the milkspurge family Euphorbiaceae is the widely cultivated Cassava (*Manihot esculenta*) in Nigeria. Cassava is a root crop originating in South America and grown in tropical and sub-tropical areas throughout the world. Cassava use varies significiantly by regions. In Africa, cassava is primarily grown for food; in Asia, production is typically for industrial purposes, including ethanol, while in Latin America and the Carribbean; it is commonly used in animal feed. There are bitter and sweet varieties. Bitter variety has high cyanide

*Corresponding Author's E-Mail: ezebuirochikason@yahoo.com

content and must be processed before consumption, examples, TMS 82/00661, NR 8082, TME 419 etc while sweet varieties have low cyanide content, example, NR 84151, TMS 4(2)1425, TMS 30572 etc (NRCRI,2010).

Cassava is the most important food crop for Nigeria by production quantity next to yam, which is the most important food crop by value (FAOSTAT, 2012). Nigeria is the world's largest producer of cassava with other top producers being Indonesia, Thailand, the Democratic Republic of Congo and Angola. Nigerian's production of cassava in 2012 reached 40 million metric tonnes (FAOSTAT, 2012). Nigeria is however, not among the top ten exporters of cassava worldwide and exported just about 0.55 million tonnes of its Fresh/Dried cassava in 2011.

Cassava is also seen to have high poverty-reduction cost (Nweke, 2004, FAO, 2005). Egesi et al. (2006) argue that cassava has been transformed from a reserve commodity for support in times of famine into a rural staple, and subsequently a cash crop. A study conducted by Nweke et al. (1997) shows that cassava accounts for 21% of the income of cassava producing households. Over 90% of cassava cultivation in Nigeria is cultivated by small-holder farmers (DATCO, 2012) which are widespread across almost all regions of the country. Various factors are believed to contribute to the yield gap for cassava in Nigeria. Threatening virus diseases, significant post-harvest losses, lack of proper conservation of genetic resources and lack of widespread mechanization; all impact the cassava integrated value chain.

Cassava genetic diversity is the variation of veritable characteristics present in a population of the same species. It is the number of genetic characteristics that make up species, which could be morphological or physiological. It serves as an important role in evolution by allowing a species to adapt to a new environment and to fight off parasites. The importance of genetic diversity is that it protects a species against extinction by providing multiple phenotypes.

The genetic resources of cassava consist of local, introduced landraces, improved cultivars and related wild species (Gulick et al. 1983, Hershey, 1987). Cassava genetic resources can be conserved either *in situ* or *ex situ*. As well as making important contributions to genetic resources conservation, new technologies are finding niches in agricultural production and improvement of root and tuber crops. These technologies range from *in vitro* pathogen eradication and clonal propagation to genetic transformation (Withers, 1992).

Genetic resources of *Manihot* genus is eroding in the face of expansion of agriculture, while in important cassava growing regions of Africa, hundreds of traditional varieties have been abandoned during the 20th century (Nweke and Polson, 1990; Nweke et al. 1994). The management of genetic resources is fundamental to the discipline of domestic plant genetics. However, in growing monoculture, the farmer leaves his crop vulnerable to pests and diseases or severe weather conditions. Genetic resources represent a component of the natural resource base exploited on agriculture. It is dissimilar from genetic variability, which describes the tendency of genetic characteristics (http://www.chevron.com/globalissue/corporateeresponsibility/2010).

The management of or preservation of genetic resources is important as people all around the world use many different plants for food, fuel, clothes, shelter and medicine. The worldwide crop conservation effort was created in part because of the belief that the genetic legacy of our ancestors was threatened by modern conditions, especially, record high population, technological changes and infrastructural development (Frankel, 1970). Despite several decades of concern about the danger of genetic erosion, however, our understanding and measure of it is woefully inadequate. Moreover, since genetic erosion of landraces has been inadequately tackled, the resulting uncertainty about their future has a potentially large impact on our ability to value them.

Concern has been expressed that human activities like urbanization, the replacement of traditional agricultural systems by modern industrial methods or the introduction of modern-high-yielding varieties may decrease the existing biological resources.

Investigation into farmers approaches to cassava genetic resources and conservation of cassava genetic resources in south-east agro-ecological zone of Nigeria took into consideration the following:

I. Socio-economic characteristic of the farmers,
II. Ascertain types of cassava genetic resources planted by the farmers in the study area.
III. Examine farmers indigenous conservation practices of cassava genetic resources, and

IV. Estimate the type of conservation methods practiced by the farmers

METHODOLOGY

The study area was in South-East Agro-ecological Zone of Nigeria. The zone lies between latitude $4^0 20^'$N and $7^0 25^'$North and longitude $5^0 21^'$ and $8^0 51^'$ E. It covers a land area of about 109,524km^2, which represents 11.86% of the total area of Nigeria (Ekong, 2008). The area lies mainly on plains under 200m above sea level. The zone has a population of about 18.92 million or 21.48% of the total population of Nigeria (NPC, 2006). About 60% of the population resides in the rural areas, with agriculture as the dominant occupation of the people. The rainfall pattern is bi-modal with about 400mm - 1500mm per annum and with temperature range of 25^0C – 39^0C. The relative humidity ranges from 82 - 85% in the coastal area to 70 – 80% in the hinterland. The relative humidity is highest during the rainy season and lowest during the dry season (NRCRI, 2011).

The soils are underlain by a mixture of coastal plain sands and sandstone (FDALR, 1985). The zone is characterized by three major vegetation types; the mangrove or swampy forest, the rain forest and the derived savanna (Inyang, 1975).The climatic condition of the zone is equatorial in nature which is being influenced by the North-East and South- West trade winds, which determine the dry and wet seasons of the zone respectively. The major language spoken in Abia and Ebonyi states is Igbo, though there are dialectical variations. Akwa Ibom State has three major languages, Anang, Ibibio and Oron.

For the purposes of this study, cluster sampling of the three major vegetative zones were delineated (Mangrove/swampy area, rain forest and derived savanna). Then purposive sampling of a state each from the clusters was made. The states were Abia for the rain forest belt, Akwa Ibom for the mangrove belt and Ebonyi for the derived savanna. The states were also selected because cassava production is the predominant agricultural activity in the areas. The population of the study was cassava farmers in the zone randomly selected from the clusters as they represent major vegetative belts in the zone. Multi-stage random sampling was adopted in the selection of the sample size based on the Agricultural Development Programme arrangement on ground. From the purposively selected states of Abia, Akwa Ibom and Ebonyi, sample size of 480 respondents were cumulatively chosen.

Two agricultural zones out of three in each state were randomly selected in the first instance. Umuahia and Ohafia zones were selected from Abia, Eket and Oron zones from Akwa Ibom and Ebonyi north (Abakiliki) and Ebonyi south (Afikpo) were selected from Ebonyi State.

In the second stage, two blocks were randomly selected from each zone. Thirdly, four circles were randomly selected from each block. Finally, ten cassava farmers were randomly selected from each circle. Listing of cassava farmers was through the guidance of Extension Agents (E/As) in-charge of the selected circles.

Data collection was by the use of structured interview schedule from the 480 respondents sampled for the study by employing the services of Extension agents (E/As). Objectives 1, 2 and 3 were discussed using descriptive statistics like frequencies and percentages while objective 4 was analyzed using inferential statistics such as Tobit regression analysis. Answers to these helped make useful recommendations to farmers and research. Tobit regression analysis was employed to analyze (objective 4), the determinants of level of use of the modern conservation practices of cassava genetic resources.

Level of use of the technologies was done using a 5 point Likert - type scale.

Level of use of technology	Scale
Scarcely used	1
Occasionally used	2
Regularly used	3
Frequently used	4
Very frequently used	5

Farmers with use score of 3 or more were regarded as having reached average score of technology, i.e regularly used while farmers with score less than 3 were either at scarcely or occasionally used. For objective 4 to model the effect of use decision, a Tobit model was used. This model (Chow, 1983 and Maddala, 1975) has found several empirical applications in the literature (Adesina and Buidu-Forsun, 1995 and Ransom et al, 2003). The dependent variable is level of use of modern

conservation practices. To avoid the sensory bias that Ordinary Least Square (OLS) could generate, a Tobit censored at 1 was used because level of use smaller than 1 was not observed. Holloway et al, (2004) pointed out that even when a Tobit procedure is used incorrectly assuming that the two points of censoring in the sample is 1 also imparts a bias to the parameter estimate. The Tobit approach conserves degrees of freedom and is relevant in this case where the dependent variable had a continuous effect in the independent variables.

Since the level of use cannot be negative (the threshold is one), the dependent variable can be written using an index function as;

$I^* = B^T X; + ei$ ………. (4)

$Yi = 0 \text{ if } I^* = T$ ………. (5)

$Yj = 1 \text{ if } 1^* > T$ ………. (6)

Where, Yj represents a limited dependent variable which simultaneously measures the decision to use conservation practices and the intensity of use. Thus I* is an underlying latent variable that indexes use.

T is an observed threshold level; x is the vector of independent variables affecting use and intensity of use. B^T is a vector of parameters to be estimated, and ei is the error term.

Explicitly specified thus;

$Y = f(X_1, X_2, X_3, \ldots\ldots X_n)\ ei$

Where:

Y = Level of use (%)
X_1 = Age (Years)
X_2 = Educational Attainment (years)
X_3 = Sex (Dummy variable; 1 = Male, 0 = Female)
X_4 = Farm size (ha)
X_5 = Number of Extension Contact (Dummy variable 1=Yes, 2=No)
X_6 = Location (Dummy variable; 1 = Rural, 0 = Urban)
X_7 = Household size
X_8 = Membership of cooperative Society (Dummy variable; 1=Member, 0 = otherwise)
X_9 = Farming experience (Years)
X_{10} = Marital status: 1= Married, 0= otherwise
ei = Error term

RESULTS

The results are discussed in Tables' 1-5. Table 1 looked at the socio-economic characteristics of the respondents; Table 2 shows the types of cassava genetic resources planted by the farmers. Table 3 discussed the local conservation traits, while Table 4 looked at some indigenous conservation practices for cassava genetic resources. Table 5 considered the estimation of determinants of level of use of cassava conservation practices.

DISCUSSION OF RESULTS

Sex: Table 1 shows the socio-economic characteristics of the respondents. The male respondents constituted 61.5%, while female were 38.5%. The male dominant in this study showed that males have better access to production factors than females.

Age: The mean age of the respondents was 26.0 years, indicating that they are in their productive age. Age is expected to have positive influence on the respondents' participation in innovative ideas. It enables farmers to accumulate resources and experiences over years to enable them increase productivity.

Farm Size: The mean farm size was 2.45 hectares, indicating that the farming enterprise is subsistence in nature.

Education: The result showed that the farmers had adequate educational background relevant for conservation activities. Education helps in the enlightment of people to become acquainted with their environment and changes of everyday life. Result of Table 2 showed that 70.0% of the respondents grew both improved and landraces, while 20.5% grew improved varieties only. Egesi (2011) opined that since cassava is eaten in various food forms by more than 70 million Nigerians on daily basis, improving on the yield will be important in achieving food security. Certain cassava cultivars

Table 1. Distribution of respondents according to sex, age, farm size and educational attainment.

Variable	Frequency	Percentage
Sex		
Male	295	61.5
Female	185	38.5
Total	**480**	**100.00**
Age (Years)		
< 30	18	3.8
31 – 40	69	14.3
41 – 50	185	38.5
51 – 60	138	28.8
> 60	70	14.6
Total	**480**	**100.00**
Mean	26.0	
Farm size (ha)		
< 1.0	84	17.5
1 – 2	188	39.2
3 – 4	88	18.3
5 – 6	68	14.2
7 – 8	23	4.8
9 – 10	15	3.0
> 10	14	3.0
Total	**480**	**100.00**
Mean	2.45	
Educational attainment		
No formal education	61	12.7
Primary school education	154	32.0
Secondary school education	119	24.8
OND	35	7.3
NCE	41	8.5
HND	31	6.5
B.Sc	31	6.5
M.Sc	8	1.7
Total	**480**	**100.00**

are predominantly cultivated in specific areas and farmers' preferences are based on certain varietal characteristics. These characteristics affect farmers'

Table 2. Distribution of respondents according to types of cassava genetic resources planted.

Variable	Frequency	Percentage
Landraces	17	3.5
Improved varieties	98	20.5
Both improved and landraces	365	76.0
Total	480	100.00

Source: Field Survey Data, 2014.

perception and the dynamics of adoption of cassava varieties.

The result of Table 3 showed that 56.2% of the respondents conserved cassava varieties by maintaining favoured varieties, while 14.6% and 12.3% are by indigenous production and names respectively.

Among the farmers, the only means of conserving these species is in the field genebank where the materials are maintained in the vegetative state. Conservation is expensive especially in the face of modern conservation methods like tissue culture, cryopreservation and biotechnology. Farmers' preferred methods(s) of conservation should be improved upon and encouraged vis- a– vis the improved conservation methods. Oyewole (2009) stressed the need to have adequate understanding of the farmer, his varying environment, including the understanding of the knowledge behind his knowledge and the decision he took, prompting a re-direction of policy formulation from top – down, to bottom – to – top technology approach.

However, an understanding of farmers' indigenous knowledge (IK) and technology is not that easy, as indigenous knowledge and technology may be as numerous as sampled farmers. To say that farmers' indigenous practices are perfect is to leave no room for improvement as many of the practices they engage in may lack scientific basis and may have no long term prospect of meeting the food need of exploding population in the face of limited resources. The result of Table 4 showed that 44.8% of the respondents store their cassava stakes under the shade, while 32.1% allow the plants to continue to grow in the field until when needed. About 12.5% of the respondents plants in fadama (hydromorphic) areas during the dry season. The scarcity and high cost of planting materials necessitates the need to conserve them for future use as they are constraints

Table 3. Distribution of respondents according to local conservation traits.

Variables	Frequency	Percentage
Myths	5	1.0
Songs	3	0.6
Names	59	12.3
Indigenous production	70	14.6
Collection	35	7.3
Trading	1	0.2
Stealing	3	0.6
Maintaining favoured varieties	270	56.2
Purging the less desirable	33	7.0
Others	1	0.2
Total	480	100.00

Source: Field Survey Data, 2014.

Table 4. Distribution of respondents based on other indigenous practices for cassava conservation.

Variables	Frequency	Percentage
Allow the plants grow in the field	154	32.1
Planting in Fadama areas during dry period	60	12.5
Storage of stakes under shade	215	44.8
Others	51	10.6
Total	480	100.00

Source: Field Survey Data, 2014.

to farmers. Often, major reasons why farmers do not cultivate species or varieties are limited access to appropriate germplasm and to information they need on how to plant, manage and use the materials. The result in Table 5 showed the Tobit Regression Estimates of the Determinants of level of use of conservation practices for cassava Genetic Resources in the study area, such as tissue culture, biotechnology, cryopreservation and seed storage. The chi ^{2} value of 21.73 was significant at 1% level probability indicating a Tobit Regression of best fit. The coefficient of education was positively correlated and significant at 5% level of probability. This implies that any increase in education will lead to a corresponding increase in probability and intensity of use of conservation practices. This result agrees with *a priori* expectations that education enhances farmers' ability to understand and evaluate new technologies and is consistent with the result of Onu et al. (2000).

The coefficient of farm size was negatively correlated and highly significant at 1% level of probability. This implies that any increase in farm size will lead to a corresponding decrease in probability and intensity of use of conservation practices. This result is contrary to *a priori* expectation that larger farmers are technically efficient than smaller ones. Bravo-Ureta and Pinheiro (1997) found no significant relationship between farm size and use of technologies. The coefficient of extension contact was positively correlated and highly significant at 1% level of

Table 5. Estimation of Determinants on Level of use of Cassava Conservation practices in the study area.

Variable	Coefficient	Standard error	t-value	P < (t)	95% Conf.	Interval
Constant	16.03588	5.656407	2.83**	0.005	4.84202	27.22974
Age	.0290453	.0800217	0.36	0.717	-.1293153	.1874059
Education	.4597546	.1485934	3.09**	0.008	-.9496106	.4301015
Sex	3.026831	1.039954	2.91**	0.001	-5.876457	- .1772047
Farm size	-.4728913	.1337572	-3.53***	0.000	-.9354899	- .0102928
Extension	1.159572	.2088694	5.55***	0.000	-2.760301	.4411567
Farm location	-.7174239	1.007444	0.71	0.478	-2.711125	1.276277
Household size	-.042827	.2277091	-0.19	0.851	-.4934766	.4077825
Membership of cooperative	4.252828	1.353161	3.14**	0.002	1.574962	6.930695
Farming experience	-.0113014	.0741723	-0.15	0.879	-.1572091	.1354834
Marital status	.2661151	.9288701	0.29	0.077	-1.572091	2.104322

LR chi^2 21.73 ***
Pseudo R^2 0.6450
Source: Field Survey Data 2014
** and *** is significant at 5% and 1% level of probability.

probability. This implies that any increase in extension contact will lead to a corresponding increase in probability and intensity of use of the conservation practices in the study area.

The coefficient of membership of cooperative societies was positively correlated and significant at 5% level of probability. This implies that farmers who belonged to social organizations had more probability and intensity to use the conservation practices than their counterparts who were non-members. This is consistent with Okike (2000) in Northern Nigeria and *a priori* expectations that members have more access to agricultural information, credit and other production inputs as well as more enhanced ability to adopt innovations. The coefficient of age and marital status were positively correlated but not significant as well as distance to farm; while household size and farming experience were negatively correlated.

CONCLUSION

Landraces in many crops have been identified as the most threatened category of genetic resources and are also the primary object of demands for compensation. Farmers' conservation of cassava genetic resources in south-east agro-ecological zone of Nigeria will be actualized if the farmers are conscious of the fact that genetic resources and their conservation are necessary in the conservation of nature and to ensure food security. The expectation is that improvement on the socio-economic characteristics of the farmers and elimination of the constraining factors will greatly improve conservation practices.

REFERENCES

Adesina AA and Buidu-Forsun J (1995). Farmers' Perception and Adoption of New Agricultural Technology: Evidence from Burkina Faso and Guinea. West Afr. Agric. Econ., 13: 1-9.

Bravo-Ureta BE and Pinheiro AE (1997). Technical, Economic and Allocative efficiency in Peasant Farming Evidence from the Dominica Republic "The Development Economics". 35(1): 48-57.

Chow GC (1983). Econometrics. Third edition, Singapore: McGraw-Hill, L. and Demery, L.

(2007), Down to Earth: Agriculture and Poverty Reduction in Africa, directions in Development, World Bank: Washington D.C. Croppenstedt, A., Demeke, M. and M. Meschi (2003). Technology Adoption in the presence of constraints: The Case of Fertilizer Demand in Ethiopia. Rev. Develop. Econ., 7-1: 58-70.

DATCO (2012). http://www.dadtco.nl/?page=1134. (Accessed: 12th June. 2012).

Egesi C, Mbanaso E, Ogbe F, Okogbenin E and Fregene M (2006). Development of Cassava Varieties with high value root quality through induced mutations and marker-aided breeding, NRCRI, Umudike Annual Report 2006-6.

Egesi CN (2011). Registration and release of five cassava varieties in Nigeria, NRCRI Annual Report 2011, 1-5.

Ekong F (2008). Contribution of Women to National Development: Examples from Akwa Ibom State. www.info.rdg.ac.uk/publication/searches.asp (Accessed Nov. 2009).

FAO (2005). International Trade in Cassava Products: an African Perspective.

FAOSTAT (2012). Food Outlook: Global market analysis. Global information and Early Warning System on Food and Agriculture (GIEWS) http://reliefweb.int/files/resources/a1993e00.pdf

FDALR (1985). Reconnaissance Survey of Imo State, Nigeria, Soil report, FDALR, Kaduna.

Frankel OH (1970). Genetic conservation in perspective. In: O.H. Frankel and E. Bennet (Eds.). Genetic Resources in plants – Their exploration and conservation. IBP Handbook No 11. Pp. 469-489. Blackwell Scientific Pubs. Oxford Goetz, 1992. A selective model of household food marketing behaviour in Sub-Sahara Africa. Am. J. Agric. Econ., 74: 44-452.

Gulick P, Hershey C and Alcazar JE (1983). Genetic resources of cassava and wild relatives. Series ASPG: IBPGR/82/111. IBPGR Secretariat; Rome, Italy p. 56.

Hershey C (1987). Cassava germplasm resources. Proc. Workshop on cassava breeding: a Multidisciplinary review. Philippines. 4 – 7 March, 1985.

Holloway G, Nicholoson C, Delgado C, Staal S and Ehui S (2004). A Revisited Tobit Procedure for Mitigating Bias in the Presence of Non-Zero Censoring with an Application to Milk-Market Participation in the Ethiopia Highlands. Agricultural Economics, 31: 97-106. http://www.chevron.com. Accessed 2010.

Inyang PEB (1975). Climate regions of Eastern Nigeria. Ethiope Publishing House, Benin City, Nigeria.

Maddala GS (1975). Limited Dependent and Qualitative Variable in Econometrics. London: Cambridge University Press, London.

NPC (2006). The 2006 National Census. www.nigeriamus.com/nigeria2006population-Census. Accessed October, 2009.

National Root Crops Research Institute (NRCRI) (2011). Weather Data. Meterological Unit, NRCRI, Umudike.

National Root Crops Research Institute, Umudike (NRCRI) (2010). Annual Report.Pp 15-20.

Nweke FI and Polson R (1990). The dynamics of Cassava in Africa. Preliminary analysis of indicator. A report from phase 1 of the Collaboration Study of Cassava in Africa (COSCA) for discussion at the 3rd meeting of the steering committee of COSCA in London, August 13 – 15, 1990. Pp. 71-76.

Nweke FI, Dixon AGO, Asiedu R and Folayan SA (1994). Cassava varietal needs of farmers and the potential for growth in Africa. Collaborative study of cassava in Africa. Working paper N0. 10 Resource and Crop management Division, IITA Ibadan, Nigeria.

Nweke FI, Ugwu BO, Dixon AGO, Asadu CLA and Ajobo O (1997). Cassava Production in Nigeria: A function of farmer access to market and to improved production and processing technologies. COSCA working paper N0. 21. Collaborative study of cassava in Africa, International Institute of Tropical Agriculture, Ibadan, Nigeria.

Nweke FI (2004). New Challenges in Cassava Transformation in Nigeria and Ghana (N0. 118). Int'l Food Policy Research Institute.

Okike I (2000). "Crop-Livestock Interactions and Economic efficiency of Farmers in the Savannah Zone of Nigeria" Ph.D Thesis, Department of Agricultural Economics, University of Ibadan. p. 155.

Onu JK, Amaza C and Okunmadewa FU (2000). Determinants of Cotton Production and Economic Efficiency. Afr. J. Bus. Econ. Res., 1(2). Pp 34-40.

Oyewole CI (2009). Understanding Indigenous Cropping Technology in Kogi State, Nigeria. Nigerian Journal of Indigenous Knowledge and Development. (1): 118 – 191.

Ransom JK, Paudyal K and Adhikari K (2003).Adoption of Improved Maize Varieties in the Hills of Napel. Agric. Econ., 29:299-305.

Withers LA (1992).Constraints and prospects of complementary conservation pmethods and strategies of cassava germplasm. International Crop Network Series, 10. International Network for cassava genetic resources held at CIAT, Cali, Colombia, 18-23 August, 1992. Pp135-140.